

Math 115

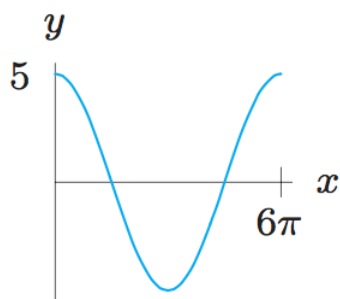
Worksheet Section 1.5

Important remark: In this worksheet, all the angles under consideration are in *radians*.

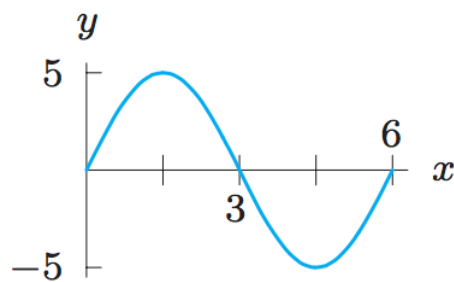
Problem 1. Answer the following questions in terms of A, B, C . If you are stuck, try first with $C = 0, A = 1, B = 1$.

- (a) The sinusoidal function $f(t) = C + A \sin(Bt)$ has amplitude _____ and period _____.
- (b) The sinusoidal function $g(t) = C + A \cos(Bt)$ has amplitude _____ and period _____.
- (c) How would I triple the amplitude of $\sin(x)$? Double the period of $\cos(x)$?
- (d) $C + A \cos(0) =$ _____ and $C + A \sin(0) =$ _____.

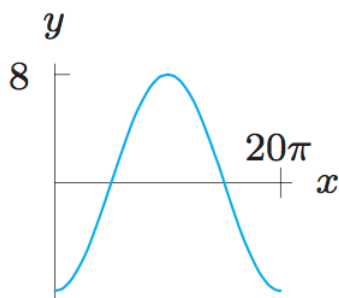
Problem 2. Find a possible formula for each of the graphs below.



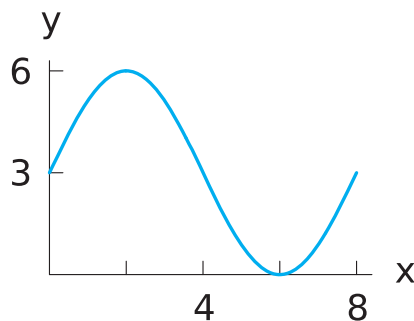
(a)



(b)

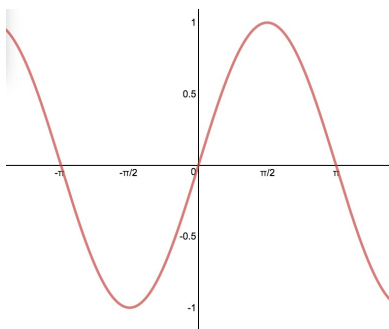
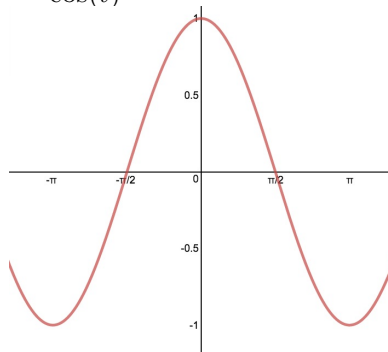
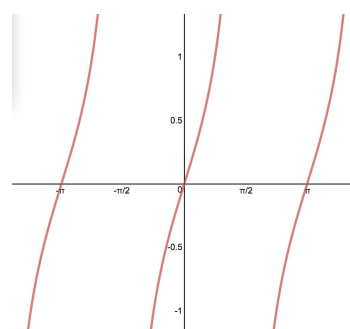


(c)



(d)

Problem 3. The desert temperature, H , oscillates daily between 40°F at 5am and 80°F at 5pm. Write a possible formula for H in terms of t , measured in hours from midnight. Draw a graph of $H(t)$. What are the period and amplitude of $P(t)$?

Problem 4. $\sin(t)$  $\cos(t)$  $\tan(t) = \frac{\sin(t)}{\cos(t)}$ 

- (a) How many solutions can you find on the graph above to $\sin(t) = 0.5$?
- (b) Estimate them (roughly – you can use that $\pi \approx 3$ if you like).
- (c) How are these solutions related to each other, and how would you find more solutions?
- (d) Which of these solutions gets the special name “ $\arcsin(0.5)$?”
- (e) Repeat parts (a)–(d) for both $\cos(t) = 0.5$ and $\tan(t) = 0.5$
- (f) (1.5 #27, 31) Find a solution for each of the following equations, if possible:

$$2 = 5 \sin(3x) \qquad 8 = 4 \sin(5x)$$

Problem 5. (Winter 2012 Exam 1 Problem 7) Enjoying breakfast outdoors in a coastal Mediterranean town, Tommy notices a ship that is anchored offshore. The ship is stationed above a reef which lies below the surface of the water, and a series of waves causes its height to oscillate sinusoidally with a period of 6 seconds. When Tommy begins observing, the hull of the ship is at its highest point, 20 feet above the reef. After 1.5 seconds, the hull is 11 feet above the reef.

- (a) Write a function $h(t)$ that gives the height of the ship’s hull above the reef t seconds after Tommy begins observing.
- (b) According to your function, will the hull of the ship hit the reef? Explain.